



Version List for DER-CAM

Only the most recent versions of DER-CAM are shown and described below.

Legend for table:

I&P: Investment and Planning version: determines optimal equipment combination and operation based on *historic* load data, weather, and tariffs

O: Operations version: determines optimal multi-day-ahead scheduling for installed equipment and *forecasted* loads, weather and tariffs

web: free available academic and non-commercial version with limited features, access at <http://building-microgrid.lbl.gov/projects/how-access-der-cam>

det: deterministic version, all data is assumed to be known perfectly

stoch: stochastic version in which some input data can be specified as scenarios and is used in stochastic programming

research: research license which needs a collaboration license agreement

comm: non-exclusive commercial license is available

An overview about DER-CAM and microgrid research can be found at: http://building-microgrid.lbl.gov/sites/all/files/microgrid_research_one_pager.pdf.

Overview of the most recent DER-CAM projects can be found at: http://building-microgrid.lbl.gov/sites/all/files/DER-CAM%20August%202014_V10.pdf

The video http://www.nrel.gov/esi/seminar_economic_and_environmental_optimization_of_microgrids.html, presented at NREL on 28 March 2013 as part of the Energy Systems Integration Seminar Series, discusses some of our current projects and the results of various case studies.

Instructions on how to use the simplified web version of DER-CAM can be found at: http://building-microgrid.lbl.gov/sites/all/files/projects/WebOpt_Take2.mp4

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Version Number	Characteristic	Public Release Date	Accessibility	Uncertainty	Features	Publication
3.9.4	I&P	24 April 2012	research / comm	det	<ul style="list-style-type: none"> ☺ 36 load profiles characterizing a year (week, weekend, peak profiles for every month) ☺ optimizes one typical year based on the 36 load profiles ☺ 5 load profile types: electricity only, cooling, refrigeration, heating, domestic hot water, and natural-gas-only ☺ natural gas as energy carrier for combined heat and power (CHP) ☺ CHP, electric and heat storage, PV, solar thermal, absorption cooling, heat pumps, basic load shifting, basic efficiency measures, electric vehicles; ☺ fuel cell run-time constraint to model SOFC and PEM fuel cells ☺ multi-objective (costs and CO₂) ☺ policy measures as feed-in tariffs or Self Generation Incentive Program in California ☺ allows to force technologies into the solution ☺ electricity sales ☺ ZNEB and ZCB 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6071e.pdf 📖 http://eetd.lbl.gov/sites/all/files/lbnl-4929e.pdf 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6354e.pdf
3.9.4a	I&P		research / comm	det	<ul style="list-style-type: none"> ☺ based on 3.9.4 from above, but with California Peak Day Pricing modeled 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6267e.pdf
3.9.4.d	I&P	Spring 2015	research	det	<ul style="list-style-type: none"> ☺ based on 3.9.4, but ☺ with district heating and GIS capabilities 	
WebOpt version 2.5.1.26	I&P	July 2014	web / academic	det	<ul style="list-style-type: none"> ☺ based on 3.9.4 from above ☺ with load profile database for ASHRAE Climate zones (762 buildings in the US) ☺ with solar radiation database for the whole US ☺ automatic multi-objective frontier feature ☺ Chinese and English version available ☺ continuous technologies (PV, storage, etc.) can be forced into the solution ☺ advanced user management that allows private web-server space for WebOpt files ☺ extended manual with search feature ☹ without electric vehicles 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/projects/how-access-derscam 📖 http://building-microgrid.lbl.gov/sites/all/files/projects/WebOpt_Take2.mp4

					<ul style="list-style-type: none"> ⊗ without policy measures as feed-in tariffs or Self Generation Incentive Program in California ⊗ without electricity sales ⊗ without ZNEB and ZCB 	
WebOpt version 4.1.2, no reduced functionality	I&P	October 2014	web / academic	det	<ul style="list-style-type: none"> ☺ based on 4.1.2, but ☺ with a full functional user interface for 4.1.2 ☺ microgrid planning and operations for critical facilities considering outages due to natural disasters (islanding capabilities) 	
4.0.0	I&P	July 2013	research/comm	det	<ul style="list-style-type: none"> ☺ based on 3.9.4 from above ☺ with cold storage ☺ with passive measure (window change, building shell upgrades) ☺ passive measures influencing heating and cooling loads ☺ multi temperature heat storage (65C and 95C) ☺ multi-energy carrier for distributed energy resources and heating 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6305e-poster.pdf 📖 http://building-microgrid.lbl.gov/sites/all/files/DER-CAM%20August%202014_V10.pdf 📖 http://dx.doi.org/10.1016/j.apenergy.2014.07.041 📖 http://www.sciencedirect.com/science/article/pii/S0306261914007181
4.1.1	I&P	Dec 2013	research/comm	det	<ul style="list-style-type: none"> ☺ based on 4.0.0 from above, but ☺ with non-linear efficiency curve modelling for CHP systems, linearization with Special Order-Set and binary variables 	<ul style="list-style-type: none"> 📖 Journal paper in preparation, more information via email to MStadler@lbl.gov 📖 http://building-microgrid.lbl.gov/sites/all/files/DER-CAM%20August%202014_V10.pdf
4.1.2	I&P	Sept. 2014	research/comm	det	<ul style="list-style-type: none"> ☺ based on 4.1.1 from above, but ☺ microgrid planning and operations for critical facilities considering outages due to natural disasters (islanding capabilities) ☺ with wind 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/DER-CAM%20-%20microgrid%20resilience_V7.pdf 📖 http://building-microgrid.lbl.gov/sites/

						all/files/DER-CAM%20August%202014_V10.pdf
5.0.0	I&P	Fall 2014	research	det	☺ based on 4.1.2, but ☺ with consideration of multi-building sites with component location optimization (power flow) ☺ consideration of electrical cable capacity constraints (power flow)	
3.10.5.m	I&P	February 2014	research	det	☺ based on 3.9.4 from above, but investment decision modelling ☺ with multiple year optimization horizon which <ul style="list-style-type: none"> • optimizes building total energy cost over several years (the number of years is a set that can be modified by the user) • has an option that does/does not renew investments (same technologies, same capacities) in installed technologies after the lifetime is reached ☺ with linear model for battery degradation (i.e. capacity loss due to ageing) ☺ with PV degradation model ☺ with variable performance for technologies; efficiency, investment costs, etc. can vary over time and model technology breakthroughs and advancements	📖 Journal paper in preparation, more information via email to MStadler@lbl.gov 📖 http://building-microgrid.lbl.gov/sites/all/files/DER-CAM%20August%202014_V10.pdf
1.1.0.w	I&P	April 2012	research	det	☺ based on 3.9.4 from above, but ☺ with 12 typical week profiles to better model load shifting between week days and weekend days	
2.1.1.w	I&P	February 2014	research / comm	det	☺ based on 1.1.0.w, but ☺ with multiple year optimization horizon which <ul style="list-style-type: none"> • optimizes building total energy cost over several years (the number of years is a set that can be modified by the user) • has an option that does/does not renew investments (same technologies, same capacities) in installed technologies after the lifetime is reached ☺ with linear model for battery degradation (i.e. capacity loss due to ageing) ☺ with PV degradation model ☺ with variable performance for technologies; efficiency, investment costs, etc. can vary over time and model technology breakthroughs and	

					advancements	
1.1.0.s	I&P	01 March 2013	research	stoch	<ul style="list-style-type: none"> ☺ based on 1.1.0.w from above ☺ but with 12 typical week profiles to better model load shifting between week days and weekend days ☺ new electric vehicle fleet management module ☺ uncertainty in EV driving pattern ☺ stochastic capabilities enabled 	<ul style="list-style-type: none"> 📖 http://eetd.lbl.gov/sites/all/files/lbnl-5937e.pdf 📖 http://gig.lbl.gov/sites/all/files/lbnl-6416e.pdf
2.0.0.s	I&P	spring 2014	research	stoch	<ul style="list-style-type: none"> ☺ based on 1.0.0.s ☺ consideration of uncertainty for wind and PV ☺ islanding and microgrid reliability ☺ variable time-step 1hr, 15min, 5min 	
Operations DER-CAM 6.3.ev	O	TBD	research / comm	det	<ul style="list-style-type: none"> ☺ Operations DER-CAM code with EV fleet management and cost-optimal frequency regulation bid for day-ahead ancillary services market ☺ variable time-step 1hr, 15min, 5min ☹ no other technologies are supported in this version 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6154e.pdf
Operations DER-CAM 6.4	O	August 2014	research	det	<ul style="list-style-type: none"> ☺ based on 6.0 but with ☺ ramping constraint and costs for DGs ☺ start-up modelling and costs for DGs ☺ minimum run- and downtime constraints for DGs 	
Operations DER-CAM 6.5	O	Dec. 2014	research	det	<ul style="list-style-type: none"> ☺ based on 6.4 but with ☺ consideration of load-dependent COP for chillers ☺ consideration of startup costs and minimum up time and ramp rate constraints for the generators ☺ cooling load input in terms of kW thermal rather than kW electrical equivalent 	
Operations DER-CAM stochastic version 6.1.2.s	O	2011	research	stoch	<ul style="list-style-type: none"> ☺ added stochastic capabilities based on Operations DER-CAM 6.0.0 ☺ enabled choice for individual DG technologies to behave deterministically or stochastically ☺ added hourly max output parameter to model outages in DG (applied to fuel cell) ☺ stationary storage behaves as deterministic to compensate for uncertainty in DG output 	<ul style="list-style-type: none"> 📖 http://building-microgrid.lbl.gov/sites/all/files/lbnl-6309e.pdf